

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

# PCT

To:

see form PCT/ISA/220

## WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing  
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference  
see form PCT/ISA/220

**FOR FURTHER ACTION**  
See paragraph 2 below

International application No.  
PCT/EP2005/050859

International filing date (day/month/year)  
01.03.2005

Priority date (day/month/year)  
02.03.2004

International Patent Classification (IPC) or both national classification and IPC  
C08F110/06, C08F4/64

Applicant  
TOTAL PETROCHEMICALS RESEARCH FELUY

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

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WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITYInternational application No.  
PCT/EP2005/050859**10/591408****Box No. I Basis of the opinion**

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
  - ☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material:
    - ☐ a sequence listing
    - ☐ table(s) related to the sequence listing
  - b. format of material:
    - ☐ in written format
    - ☐ in computer readable form
  - c. time of filing/furnishing:
    - ☐ contained in the international application as filed.
    - ☐ filed together with the international application in computer readable form.
    - ☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/EP2005/050859

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**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	1-12
	No: Claims	
Inventive step (IS)	Yes: Claims	
	No: Claims	1-12
Industrial applicability (IA)	Yes: Claims	1-12
	No: Claims	

2. Citations and explanations

**see separate sheet**

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**Box No. VIII Certain observations on the international application**

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The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

**see separate sheet**

**Re Item V**

**Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

The following documents (D1-D7) will be referred to (see the ISR for the relevant passages):

- D1: WO 01/81436 A (EQUISTAR CHEM LP) 1 November 2001 (2001-11-01)
- D2: WELTON T: "Room-temperature ionic liquids. Solvents for synthesis and catalysis" CHEMICAL REVIEWS, AMERICAN CHEMICAL SOCIETY. EASTON, US, vol. 99, 1999, pages 2071-2083, XP002162959 ISSN: 0009-2665
- D3: DUPONT JAIRTON ET AL: "Ionic liquid (molten salt) phase organometallic catalysis" CHEMICAL REVIEWS, AMERICAN CHEMICAL SOCIETY. EASTON, US, vol. 102, no. 10, October 2002 (2002-10), pages 3667-3692, XP002304708 ISSN: 0009-2665
- D4: US 2002/010291 A1 (MURPHY VINCE) 24 January 2002 (2002-01-24)
- D5: US-A-5 994 602 (ABDUL-SADA ET AL) 30 November 1999 (1999-11-30)
- D6: EP-A-0 558 187 (BP CHEMICALS LIMITED) 1 September 1993 (1993-09-01)
- D7: WO 00/32658 A (BAYER AG ; SYMYX TECHNOLOGIES INC (US)) 8 June 2000 (2000-06-08)

1. D1, which is considered to be the closest prior art, describes catalytic systems in the examples such as (Cp-nBu)<sub>2</sub>ZrCl<sub>2</sub> with 1000 equiv MAO dissolved in ionic liquids such as 1-butyl-3-methylimidazolium hexafluorophosphate, added to the polymerisation reactor in isobutane where ethylene is polymerised therewith. From the description and claims it is evident that the skilled person would seriously contemplate using bridged metallocenes. The preparation of the ionic liquid itself according to present claim 1 is not mentioned in D1 but it is implicit that it must have been prepared according to present claim 1 as this involves standard organic chemistry and standard organic solvents (see also the citations in the description of D1, and D7). The subject-matter of claims 1-12 essentially differs in that the molar ratio of ionic liquid (IL) to catalyst ranges from 5-1:1 (feature 1) and the IL/catalyst system is heterogenised by adding a solvent such as heptane (feature 2). The technical effect of feature 1 has not been demonstrated over D1. The technical effect of feature 2 appears to be to provide an easily reactor-injectable powder (p.12). Therefore the

objective problem can be formulated as to provide alternative preparations of catalyst systems for olefin polymerisation. The solution proposed in claims 1-12 of the present application cannot be considered as involving an inventive step because the skilled person would regard it as a normal option to use said IL:catalyst ratios (see D6). Said heterogenisation is standard in the art (see D2 which describes biphasic IL systems used to heterogenise catalysts and products into two separate phases; see D3 which describes how organic solvents do not cause transition metal catalysts to separate out from their IL supports)), and D4 shows how it can be applied to the present case: generic R-imidazolium chloride is precipitated as a brown solid from 1:1 acetonitrile (akin to present claim 4's polar solvents) /hexane mixtures, with D5 showing that it is the hexane, akin to present claim 11's heptane, which causes the precipitation in D4 because R-imidazolium chloride is soluble in acetonitrile. Hence claims 1-12 are not considered inventive.

**Re Item VIII**

**Certain observations on the international application**

The following objections are made under Art. 6 (PCT):

1. Claim 1: step d): "using the ionic liquid to heterogenise..." and step e): "heterogenising..." describe "results to be achieved" (PCT GL Ch.-III,4.7). Furthermore, it is not clear whether the heterogenisation occurs as a result of step d) or e). See also present claim 10, where the former is implied, and the present examples where, however, the latter is implied. Moreover, the apolar solvent cannot be distinguished from the "solvent" of step b), if that too is apolar. It appears step b) may be missing a feature, namely that the solvent there is polar.
2. Claims 6-12 : these are claims for a heterogenised metallocene product or a process using said product obtained by a process (C-III,4.7b). It cannot be ascertained in the final product that this material had been produced in this way.
3. The subject matter related to the above-mentioned objections 1-2 will be ignored with respect to the considerations under Box V, since being unclear, it cannot be considered limiting for the scope of the claims.